

The Adaptation of SC-FDMA in the uplink gives edge to LTE over WiMAX2 in Ad-Hoc Network

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Abstract - Relay technologies have been actively studied and considered in the standardization process of next-generation mobile broadband communication systems such as 3GPP LTE-Advanced, IEEE 802.16j, and IEEE 802.16m. This article first introduces and compares different relay types in LTE-Advanced and WiMAX standards. Simulation results show that relay technologies can effectively improve service coverage and system throughput. Three relay transmission schemes are then summarized and evaluated in terms of transmission efficiency under different radio channel conditions. Finally, a centralized pairing scheme and a distributed pairing scheme are developed for effective relay selection. Simulation results show that the proposed schemes can maximize the number of served UE units and the overall throughput of a cell in a realistic multiple-RS-multiple-UE scenario.

Index Terms – mobile broadband, WiMAX standards, multiple-RS-multiple-UE scenario.

I. INTRODUCTION

In the last five years there is lot of research and of attention improved in wireless network. For the last five years research there is no commercial implementation of WiMAX2 in the market. Wireless networks play a very important role in commutation today. People want demand information from anywhere any time. So wireless technology helps to solve this problem. To resolve this problem in wired network a transport protocol is used which is TCP (transmission control protocol), one the best protocol is used in the wired environment, but it is not used and suitable in the wireless environment. Because of there is some issues are involved in this technology. This happens due to TCP assumes that packet loss and unusual delays are mainly caused by congestion. The error rate in wireless is much higher than in wired networks because of the uncontrollable external obstacles like weather and other some interference. Wireless channels often suffer from high bit error rates (BER) because they are connection less. There are even many problems with TCP in wireless such as

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satellite communication, mobile communication and wireless LANs. In the commercial there is no implementation of TCP protocol in market.

II. ABOUT WIMAX2 (WORLDWIDE INTEROPERABILITY FOR MICROWAVE ACCESS VERSION 2)

WIMAX is a wireless digital commutation system which intended to a metropolitan area, and which can transfer the data up to 30miles and for mobile station up to 15miles. Wifi-like data can be supported to WiMAX2, but there is problem with interference. WiMAX is a broad band like IP based technology with is performance like 802.11 or WIIFI networks of with coverage QUS of networks. [1] WiMAX2 operates on both licensed and non-licensed frequencies, depends up on market requirement. [1]

2.1 About 3GPP LTE (Third Generation Partnership Project Long Term Evolution):

The 3G is mostly used in the mobile technology in the market. 3GPP LTE is the latest standard in the mobile network technology which is derived from old GSM/EDGE and UMTS/HSPA network technologies. LTE is a set of enhancements to the Universal Mobile Telecommunications System (UMTS) which was introduced in 3rd Generation Partnership Project (3GPP) Release of 8. [3] LTE promises that there is downlink minimum rate at least 100mbps and uplink at least of 50mbps and RAN round trip is less than 8-to 10ms. The main aim of LTE standard System architecture evolution is providing like IP-based network with the replace of GPRS network. Because in the GPRS we don't have IP based sent work and it is replaced by 3G. And 3G is a technology which works like WIMAX technology. The main aim and advantages with LTE are high throughput, low latency and plug play, FDD (frequency division duplex) and TDD (Time division duplex) [2] in the same platform. And which low cost and easy setup to the end user. LTE will also support with older network technology like GSM, CDMA (with 2000) and UMTS. [3]

2.2 Literature Reviews:

There are different types of researches has been done in the past few years regarding the WIMAX2 and 3G technologies. WiMAX which is already implemented in the market, in the past few years ago, WiMAX2 which is currently most developing technology i.e. 802.16 which will be released in the market may be in next few years. In the year 2009 Mr. Syed Hamid Ali Shah, Mudasar Iqbal, Tassadaq Hussain submitted a paper on "comparison of WiMAX2 and 3GPPLTE technologies". The main aim of the paper LTE uplink and performed link level simulations

of Single Carrier Frequency Domain Equalization (SC-FDE) and Single Carrier Frequency Division Multiple Access (SC-FDMA) in comparison with Orthogonal Frequency Division Multiplexing (OFDM). The comparison has been in terms of Signal-to-Noise Ratio (SNR) and Symbol Error Rate (SER). In this project they conducted a detailed comparative study between WiMAX and 3GPP-LTE by focusing on their first two layers (MAC and Physical). The comparison included system architecture and radio aspects of their interfaces, protocol aspects of the air interfaces, mobility and QOS (quality of mobile services). And also they gave a brief competitive summary of both technologies. The project investigated LTE uplink and performance link level simulations of single carrier frequency domain equalization and single carrier frequency division multiple access in comparison with orthogonal frequency division multiplexing. The comparison included Signal-to-noise ratio. Symbol error rate. Their performance was completely done on windows vista and Matlab 7.0 running system. For theoretical results their simulation then show that Peak to average power ratio of sc-FDMA system in comparison of OFDMA. Also they simulated the capacity of multiple input multiple output system with signal input signal output systems. At the end of their simulation they concluded that both WiMAX2 and LTE are the technically similar standards. And they also concluded that there some difference presented in the uplink access used by the both technologies. And they also described that that LTE uses SC-FDMA and WiMAX2 uses OFDMA on the access method. The adaptation of SC-FDMA in the uplink gives edge to LTE over WiMAX2 because it resolves the PAPR problem of OFDMA due to its single carrier nature. [3] And also they concluded that LTE gives better performance data rate in uplink and down link due to support of MIMO system, but WiMAX2 supports MIMO only on down link direction. And also conclude that OFDMA gives high PAPR values as compared to SC-FDMA due to the use of multiple subcarriers. [9]

2.3 In the recent year Karim Ahmed Samy Banawan, Mohammed Salaheldin Abdullah, and Mohamed Abdel Ghani Mohammed El-Gharabawy they submitted a paper on “*comparative study between Mobile WiMAX2 (IEEE802.16e based) and 3GPP LTE*”. The main aim of their project is presenting the key technologies that are utilized in both systems, and then physical layers are presented, besides Network Architectures. The paper mainly different aspects Comparison between Mobile WiMAX and 3GPP-LTE standards as they also coverage up to 4G broad band access systems. This comparison focuses mainly on the physical layer aspects of the radio access technology of these two standards. For these simulation comparison parameters for both WiMAX and 3GPP-LTE technically standards are same used. After the project implementation they conclude DSL like technology offer to the mobile service and WiMAX2 to access internet in the market. They also conclude that in the developed world major UMTS/HSPA service providers will naturally evolve to 3GPP-LTE, whereas most CDMA2000 providers, as well as GSM/EDGE providers in the developing world, will select Mobile WiMAX for mobile broadband wireless access while providing service continuity over their legacy networks. [5]

2.4 In the year 2008 Carsten Ball, Thomas Hindelang, Iavor Kambourov they submitted a paper on “*Spectral Efficiency Assessment and Radio Performance Comparison between LTE and WiMAX*”. The main aim of their project is a detail performance comparison between both upcoming OFDM based mobile technology for broadband radio access 3GPP-LTE with mobile WiMAX (IEEE 802.16e). Which is already implemented in the market, but they chosen it, due this will help me to go forward development to do more in their project. [6] After their thorough analysis highlighting the differences of both competing technologies and their impacts on spectral efficiency and radio performances. System parameter has been aligned towards equal peak thought per MCS to show the technology specify behavior under different SNIR condensations. Full 3GPP and IEEE standards compliant system configuration has been ranked including for typical layer one overhead. After their analysis they concluded that the overall radio performance, however, is rather equal, thus clear-cut performance statements have to be based on higher layer design and even on network level. Profound comparison of UTRA LTE and WiMAX has been presented with focus on radio interface performance. In the overall radio performance is rather equal with LTE slightly outperforming WiMAX due to the lower overhead. Higher layer effects such as RLC/MAC and signaling overhead have not been considered, which might lead to additional impacts on the overall network performance. [6]

2.5 In the recent year Dr. Suhas Rant and his team they submitted a paper on “*WiMAX2 or LTE: Which Technology to Adopt? A Comprehensive Comparative Study*”. The main aim of their project is comprehensive comparative study to help arrive at the choice between LTE and WiMAX2. They commented that there are two types people in the market like few are depends on LTE and 3G technologies and they choosing depends up on their requirements. After the project they concluded that with LTE already in the market and it is working fine, but WiMAX2 will take another one year to implement in market. One option is that with the exception of sprint that is going to WiMAX2, most carriers are going to continue the path of GSM->HSPA->LTE which is going to be a natural evolution. With the WiMAX or WMAX2 it is fairly proven to work but there is some disadvantage of no substantial roll out of plans due to cost. WiMAX looks to have an upgrade path available by the work going on with the 802.16m standards. WiMAX is the more advance then LTE technology. [4]

III. CONCLUSION

After studying different research documents it is founded that the overall radio performance, however, is rather equal, thus clear-cut performance statements have to be based on higher layer design and even on network level. And also in the both technology's interference is one of the major issue like (weather, trees, mountains, hills etc).

REFERENCES

- [1] <http://www.WiMAX2.com/WiMAX2-tutorial/what-is-WiMAX2>.
- [2] http://en.wikipedia.org/wiki/3GPP_Long_Term_Evolution.

- [3] T.Ojanpera and R. Prasad, editors. Wideband CDMA for Third Generation Mobile Communications. Artech House Publishers, 1998.
- [4] http://xa.yimg.com/kq/groups/20725580/2080579529/nameComparative_study_between_Mobile_WiMAX2_and_LTEv3.pdf.
- [5] <http://en.wikipedia.org/wiki/MATLAB>
- [6] http://www.csd.uwo.ca/courses/CS4457b/Assignments/LTE/LTE_WiMAX.pdf
- [7] http://www.mathworks.in/academia/student_center/tutorials/launchpad.html
- [8] <http://en.wikipedia.org/wiki/WiMAX>
- [9] Syed Hamid Ali Shah, Mudasar Iqbal, Tassadaq Hussain
- [10] "Comparison between WiMAX and 3GPP LTE" Blekinge Institute of Technology August 2009,IEEE published.

BIOGRAPHY



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